

## Rich Learning Tasks: Changing the Culture of the Mathematics Classroom

Gary Flewelling

### **The Sense-Making Game**

The sense-making game is about, using one's knowledge / experience in integrated, creative, and purposeful ways to conduct investigations, inquiries, and experiments and to solve problems and, in the process, coming to better understanding of things. An important role of schools is to graduate life-long sense-makers.

People who play the sense-making game well find themselves involved such things as:

challenge	finding out	modeling	justifying
uncertainty	conjecturing	creating	proving
complexity	testing	connecting	disproving
ambiguity	revising	integrating	arguing
exploring	gathering evidence	monitoring	demonstrating
investigating	organizing	autonomy	generalizing
experimenting	applying	confirming	understanding
thinking	transforming	questioning	communicating
imagining	reflecting	making decisions	interacting
planning	patterns	clarifying	empowering

### **The Problem**

Unfortunately, many students, teachers, parents, administrators, resource developers, curriculum and test developers, politicians, and business people see the sense making game and the math-classroom game as two different games. They have experienced both and they know that these two games are played according to different rules and that they are played for different purposes. There are a number of studies that support this assertion. In DeCorte, Verschaffel, and Greer (2000), for example, we read, *'studies suggest that it is not so much a cognitive deficit that causes pupil's abstention from sense-making when doing arithmetic word problems in a typical school setting. To the contrary they are acting in accordance with the "rules of the game" which they believe to regulate the interactive ritual in which they are involved.'*

### **The Typical Math-Classroom Game**

Unfortunately, people who play the math-classroom game frequently find themselves involved with such things as:

memorization	simplicity	routine procedures	unconnected things
quick recall	knowing	other's questions	being correct
certainty	automatic response	listening	rote learning

### **The Challenge**

The challenge here is to turn the typical math classroom culture into a sense-making culture, to make the game played in the math classroom a sense-making game. Until we can do this, the best ideas, texts, tasks, tests, software, resources, technology and curriculum will continue to be under-utilized or un-utilized, under-implemented or un-implemented, under-valued or un-valued. Until we can do this,

mathematics will not be learned with deep understanding or used appropriately, powerfully, or creatively.

### **Comparison of a Sense-Making Culture with a Traditional Math-Classroom Culture**

<b>Sense-Making Culture</b>	<b>Traditional Classroom Culture</b>
1. convincing	1. unconvincing
2. the discipline as a way of thinking	2. the discipline as a collection of procedures
3. working with things that make sense	3. working with the inexplicable
4. master	4. slave
5. addresses student needs	5. ignores needs of student
6. significant to learner	6. significance lost on learner
7. known to be true	7. accepted as true
8. student active	8. student passive
9. validated by student	9. validated by teacher
10. truth as constructed	10. truth as presented
11. student-owned	11. teacher-owned
12. wielded powerfully	12. wielded mechanically
13. student as rule maker	13. student as rule taker
14. described / explained in student language	14. described / explained in teacher language
15. teacher as educator	15. teacher as inculcator
16. remembered / re-constructible	16. often forgotten / not re-constructible
17. grows into being	17. pops into existence
18. considers student readiness	18. ignores student readiness
19. experiential	19. non-experiential
20. independence / interdependence	20. dependence
21. developed by end of lesson	21. presented at beginning of lesson
22. minimal reliance on memory aids	22. reliance on memory aids
23. painting without numbers	23. painting by numbers
24. learning via a problem solving process	24. impediment to problem solving
25. connected	25. isolated
26. thorough	26. superficial
27. reading between the lines	27. reading their lines
28. develop procedures	28. follow procedures
29. a partnership	29. master-slave relationship
30. enlivens the mind	30. deadens the mind
31. enlivens the spirit	31. deadens the spirit
32. sense of personal efficacy / confidence	32. subject anxious
33. constructivist	33. destructivist
34. bringing forth a world of significance with others	34. bringing forth a world of insignificance at the insistence of others

### **A Solution**

Changing the typical math-classroom culture to a sense-making culture can be achieved by having students and their teacher work together and focus on, engage in, and experience *rich learning tasks*. They need to see what learning looks and feels like when they are so engaged. They need to experience the kind of interaction that is involved when they are so engaged. They need to experience, identify, develop, refine, value, and exercise the actions, habits, and attitudes that are important in sense-making.

### **What Makes a Learning Task Rich?**

I define a learning task as 'rich' if the task gives the learner the opportunity to:

- use (and learn to use) their knowledge in an integrated, creative and purposeful fashion to conduct investigations, inquiries, and experiments and to solve problems and in so doing,
- acquire knowledge with understanding, and in the process,
- develop the attitudes and the habits of a life-long sense-maker

### **A Comparison of Rich Tasks with More Traditional Tasks**

<b>Rich Tasks</b>	<b>More Traditional Tasks</b>
<ol style="list-style-type: none"> <li>1. prepare for success outside of school</li> <li>2. address relatively many learning outcomes</li> <li>3. address discipline and cross-curricular learning outcomes</li> <li>4. provide an opportunity to use broad range of skills in an integrated, often creative fashion, to a purpose</li> <li>5. are authentic</li> <li>6. are in context</li> <li>7. encourage a balanced use of actions</li> <li>8. are more like writing a story</li> <li>9. emphasize problem solving</li> <li>10. encourage more thinking, reflecting, and use of imagination</li> <li>11. allow for demonstration of a wide range of performance</li> <li>12. need performance assessment strategies</li> <li>13. provide enrichment within the task</li> <li>14. encourage the use of wide variety of teaching and learning strategies</li> <li>15. encourage greater engagement of students and teachers in task</li> <li>16. not a new/untried idea</li> </ol>	<ol style="list-style-type: none"> <li>1. prepare for success in school</li> <li>2. address relatively few learning outcomes</li> <li>3. address primarily learning outcomes of the discipline</li> <li>4. isolate on the use of relatively few skills</li> <li>5. are more artificial</li> <li>6. are usually out of context</li> <li>7. encourage an unbalanced use of actions</li> <li>8. are more like writing a sentence</li> <li>9. emphasize procedures</li> <li>10. encourage more recollection and practice</li> <li>11. allow for demonstration of a narrow range of performance</li> <li>12. need traditional assessment strategies</li> <li>13. usually require enrichment to be added after the task</li> <li>14. permit the use of fewer teaching and learning strategies</li> <li>15. keep students and teachers distanced from the task</li> <li>16. a much-applied idea</li> </ol>

### **Conclusion**

A math classroom needs to be a centre for sense-making. This can be achieved through the use of rich learning tasks. Students raised on a diet of rich learning tasks are likely to become life-long sense-makers. We should have no lesser goal for our students.

As John Dewey said (in his 1938), *What avail is it to win prescribed amounts of information about geography and history, to win ability to read and write, if in the process the individual loses his (or her) own soul: loses his (or her) appreciation of things worthwhile, of values to which these things are relative; if he (or she) loses the desire to apply what he (or she) has learned and above all, loses the ability to extract meaning from his (or her) future experiences as they occur.*

### **References**

**De Corte, Eric, Lieven Verschaffel and Brian Greer** "Connecting Mathematics Problem Solving To The Real World" Mathematics For Living: Proceedings of the International Conference, Amman Jordan: The Mathematics Into The 21<sup>st</sup> Century Project, 2000, p 68

**Flewelling, Gary and William Higginson** A Handbook on Rich Learning Tasks Centre for Mathematics, Science, and Technology Education, Queen's University, Kingston, 2001.